DOCUMENT RESUME

ED 419 666 SE 061 296

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TITLE Factors Impeding In-service Teachers from Adopting Constructivist Instruction Approaches.
PUB DATE 1998-04-00
NOTE 16p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (71st, San Diego, CA, April 19-22, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Action Research; *Constructivism (Learning); *Educational Change; Elementary Secondary Education; *Faculty Development; Learning Strategies; *Reflective Teaching; Science Curriculum; Science Education; Science Teachers; Scientific Methodology; *Teacher Attitudes
IDENTIFIERS Nature of Science

ABSTRACT

This study examined the influential factors toward conceptual changes in in-service teachers as they engaged in a summer professional development program. The program curricula attempted to challenge teachers over weaknesses in their pedagogical instruction, provide feasible teaching approaches, and cultivate their strengths and interests through action research projects. A variety of data sources including documents, interviews, and researcher-developed questionnaires were collected and analyzed for reflecting on the effects of remodeled curricula. Findings indicate that the in-service teachers' abilities, their prior views of the nature of students' learning, science teaching and the science discipline, and social factors impede teachers from adopting constructivist teaching approaches. (DDR)

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ED 419 666

Factors Impeding In-service Teachers from Adopting Constructivist Instruction Approaches

(Multiple paper session: **Studies on a Professional Development Program for Secondary Science and Mathematics Teachers in Taiwan**)

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Paper presented at the 1998 annual meeting of the
National Association for Research in Science Teaching
San Diego, California, U.S.A.

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SE061294

Factors Impeding In-Service Teachers from Adopting Constructivist Instruction Approaches

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ABSTRACT

This study, examined the influential factors toward conceptual changes in in-service teachers as they engaged in a summer professional development program. The program curricula attempted to challenge teachers over weaknesses in their pedagogical instruction, provide feasible teaching approaches, and cultivate teachers transforming their teaching by conducting action researches. For reflecting on the effects of remodeled curricula, varieties of data sources including documents, interviews, and researcher-developed questionnaires were collected and analyzed. The evidences indicate that the in-service teachers' ability, their prior views of the nature of students learning, science teaching and the science discipline, as well as some social factors impeding them from adopting constructivist teaching approaches.

BACKGROUND

This study is part of a curriculum remodeling action research that purported to offer in-service teachers appropriate theoretical understandings and practical experiences (Guo & Chiang, 1995; 1997). The framework of the curricula remodeling action research is illustrated in Fig. 1. In the school years 1994-1997, the in-service teachers enrolled in the professional development program were required to explore, evaluate, and identify an action research topic (the first year), conduct the action research (the second year), and present the results in a seminar (the third year) (Fig. 1). Thus, there are two parts of action research in this curricula remodeling project, one is for the professional development program in the university, the other is the action researches conducted by the enrolled teachers at the classroom level.

The professional development program is guided by the constructs of Constructivism. The goal of such a curricula revision lies in offering in-service teachers appropriate theoretical understandings and practical experiences. Regarding

to the spiral model of action research suggested by Driver (1988), developing a deep understanding of what difficulties the in-service teachers faced while they planned and conducted the action researches to improve their pedagogical instruction during the first two years is significantly important in deciding what to act later on. Therefore, this interpretive research is conducted to provide solid information for reflecting, planning, and acting.

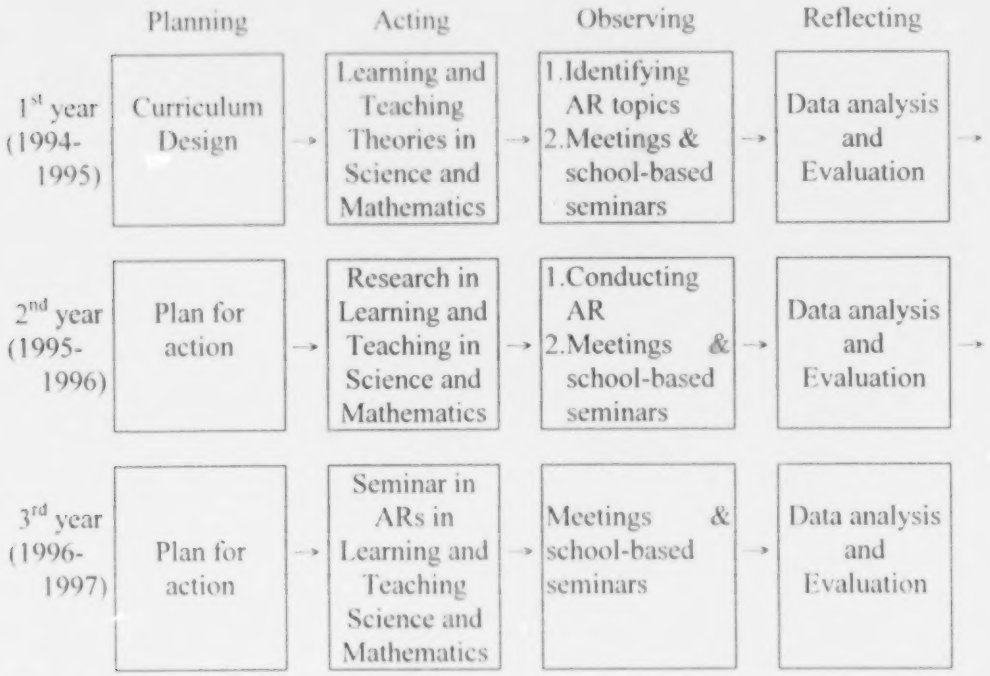

Fig.1 NCUE Professional Development Program designed. (Guo & Chiang, 1995)

THEORETICAL FRAMEWORK

Individual learners construct their own understandings of concepts, principles, phenomena, and situations (Baird, Fensham, Gunston, & White, 1991). Through unsystematic reflection on action, one's practical experience can be gained. However, a rational understanding of practice can only be gained through the actor's systematic reflection on his/her action. This rational understanding is called "personal knowledge" by Michael Polanyi (Carr & Kemmis, 1986). By personal knowledge, one make decisions about the correctness of his/her interpretation of an action. Personal knowledge develops in and through the exercise of an act. The

practitioners can only be expected to alter his or her own understanding of a situation to the extent that he or she understands others' interpretations as relevant. This is one of the reasons why the impacts of educational researches on the practitioners have been limited (Kincheloe, 1995). While knowledge is defined as "justified true belief", the teachers may not consider the findings/suggestions of educational researches as "knowledge" in this sense. Regarding the "knowledge" does not survive their practical examination (Carr & Kemmis,1986).

The contemporary Action Research Movement in education is rooted in Kurt Lewin's call for action research in social psychology (Kincheloe, 1995; King & Lonnquist, 1996). During the post World War II era, Stephen Corey led the action research movement in education for reforming curriculum practice. By the late 50s the policymakers came to relied more on "experts", action research; action research became the target of criticism and started to decline. Action research was rediscovered in the United Kingdom in the 1970s, because educators were beginning to question the usefulness of positivism doctrine in educational research and practice. However, the teachers were trained to use quantitative research methods at that time. In the 1980s, action research gained unprecedented respectability, although teacher researches were mostly criticized as ahistorical and apolitical.

Action research is defined as "a form of self-reflective enquiry undertaken by practitioners in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out" (Carr & Kemmis, 1986). In education, participants in the curriculum development processes are increasingly choosing action research as away of making decisions. The central methods of an action research is a self-reflective spiral of cycles of planning, action, observing and reflecting. Lewin suggests three importance characteristics in modern action research: participatory, democratic, and social change. And for its focus on social practice, there are two essential aims of action research: (1)the improvement of a practice, the understanding of the practice and the situation in which the practice takes place, (2)the involvement of all practitioners/participants in the action research process all its phases of planning, acting, observing, and reflecting.

King and Lonnquist (1996) listed types of action research. Although the categorical thinking about action research is somewhat limited, however, labeling the

action research could be helpful in interpreting the report. Both university level and classroom level action researches in the curricula remodeling project are defined as collaborative action research (Oja & Smulyan, 1989), in which the in-service teachers shares in the planning, implementation, and analysis of the research. For collecting evidences to reflect on the effects of the first two years, while teachers trying out the constructivist teaching approaches, the enrolled teachers' opinions and reflections were explored and examined.

The reflective processes followed in this study required the teachers (1) think critically about their teaching practice to evolve personal theories as a form of knowledge that informs them, (2) think critically about their learning in the teacher promotion program, and (3) think critically about their teaching practice guided by constructs of Constructivism.

METHODS & DATA SOURCES

The four-year program was designed as shown in figure 1. The enrolled teachers explored, evaluated and identified an action research topic in the first school year. Then, each teacher planned an action research and conducted it in the second school year. In the third and fourth school year, they learned to analyze and write an action research report. Because this research is focused on the factors impeding teachers from adopting constructivist instruction approach, therefore, the data collected were basically from the first two years. The methods used and data collected correspondingly are described as following:

(I) Eight seed teachers were selected to participate in the research team. The group meeting were scheduled at one to two weeks intervals. The activities in each meeting included group discussion, presentations, and school-based seminars. The meetings were videotaped. The researcher participatory observed all meetings and kept field notes. The videotapes were transcribed and analyzed by using constant comparative method (Strauss & Corbin, 1990).

(II) Researcher-designed questionnaires were mailed to all enrolled teachers to survey their feelings, opinions, and progresses in identifying and conducting action researches (Frey & Oishi, 1995). The questionnaires were composed of multiple choices and open-ended short answer

questions. The questionnaires returned were analyzed depend on the question modes. For multiple choice items, the data were tallied and used as references while interpreting qualitative information. The open-ended short answer questions were analyzed by using constant comparative method.

(III) Documents, written materials (reports, assignments, worksheets), letters, course materials and so on were collected, content analyzed (McKernan, 1996, p145-148) and used as background information while interpreting transcribed data.

(IV) Four teachers who were actively involved in adopting constructivist teaching approaches were selected to be interviewed individually. The researcher acted as a moderator to stimulate teachers to recall their actions and feelings. The interviews were audio-taped and transcribed for dilemma analysis (McKernan, 1996, p141-145).

(V) The teachers interviewed in (IV) were videotaped twice while they applying constructivist instruction approaches. The tapes were selectively transcribed to do episode analysis (McKernan, 1996, p157-160).

For explaining the observed education practices, Gibson (1995) argued that we could claim the reasons as personal, systematic, or structural. Concerning the limited time and complicated nature of education problems, Gibson suggests education researchers to explain, evaluate, and improve the education practices through conducting structural analysis. A structural analysis methodology conceptualizes the education practices through observing behaviors and put emphasizes on interpreting the interrelationships among structural components.

According to Gibson, (1995), while conducting structural analysis, the collected information could be interpreted in terms of four structures: ability, feelings, social, and minds, and ability is concerned as a central component to interact with other three components. Therefore, the findings emerged from the analysis procedures are further framed into these four structures and presented below.

FINDINGS

The teachers' ability in adopting constructivist teaching approaches

The teachers ability of adopting constructivist teaching approaches was increasing through the professional development program. However, the teachers performances in teaching constructively was limited in scope. Most of time, they tries out group investigation and group discussion as the pedagogical strategies, only few alternative tasks, such as hands-on activities, metacognitive learning strategies, or open inquiry, for students to work in group. Although varieties of teaching strategies corresponding to the constructs of Constructivism were demonstrated and introduced in different courses, most of the enrolled teachers recognized the methods course as the main source of learning instruction strategies. Examining the content of methods course in the professional development program, the teachers were provided rare instructional alternatives.

> Teacher Ho: ...the first theory heard was "constructivism", secondly, "problem-centered cooperative learning". After then, the problem-centered cooperative learning as considered equal to constructivism....

> Teacher Lieu: I was shocked when I heard constructivist learning theory at the first time, ...considering the constructs of constructivism, I started to notice what students received from my teaching, instead of how well they were scored. After I learned problem-centered cooperative learning and tried for a period of time, I had lots of problems, and I started to wonder, is the problem-centered cooperative learning the only way to teach constructively?

The teachers spent lot of learning time in debating the rationale in adopting problem-centered cooperative learning, partly because there was few exemplary teaching plans for modeling, and partly because it was believed that exemplary teaching plans were not universally useful for all teachers.

> Professor Huang: ...varieties of teaching aides were developed and distributed to junior high schools, however, the teachers did not know how to use them in their teaching, ...it is useless to provide aides, discussion questions, it is better to have teachers design by themselves.

> Teacher Chan: Is it necessary to design tasks alone? If having a group of teachers working together, it will be better. Most of us have to work alone...

Besides, the limited time for practicing the strategies also induced anxieties within teachers when they trying the approaches.

> Teacher Shien: In the first year, it was a new experience in trying out the constructivist approach,... it was try-and-error,... I faced many problems and felt frustrated, such as –is the strategy used appropriately, were the students adapted to the new learning environment yet, and do the students learn how to cooperate yet,...and so on.

The structure of feelings

Teachers' feelings about the professional development program that brought them conceptual conflicts were complicated. They valued the introduced pedagogical strategy progressive and worthwhile, however, it was not plausible considering the current educational practice. On the other hands, the affective support and the challenge from the research teams caused them to reconsider again and again, and tried out plans repeatedly. Plenty of related evidences shown in the videotapes transcripts and fieldnotes that teachers' feelings about the professional development program changed while they felt more comfortable with the science educators as well as their peers, and colleagues.

> Teacher Su: While I first learned Constructivism, cooperative learning, and problem-centered instruction in NCUE, I thought that

these are only theories, they will not work in educational practice. As the time passed, I felt that it is plausible to adopt cooperative learning and even more, problem-centered cooperative learning.

Teacher Chen: When I came to NCUE in the second summer, I realized that everyone faced similar problems. We shared experiences in the classes, tried to figure out ways to solve the problems. Beside, the experiences of the eight seed teachers and the encouragement from professors helped me reduce the anxieties. After that, I tried again in me class for several weeks, the effects were acceptable, excepted in time management, students performances in oral presentation, and tasks designing. I tried to ask helps from peers, and we solve the problems finally.

Teacher Chong: Probably because we had always received conventional teaching approaches, that focus on knowledge transmission and repeated practices, and we were used to these approaches, therefore, we felt uncomfortable while we first came and study here, besides, we suspected the effects of the new approach introduced. Under the encouragement of professors, we started to try it out. It was difficult and progress slowly in the beginning, however, I realized that it is not that difficult as we had thought.

The friendships among science educators and in-service teachers reinforced the collaboration among them. Besides, the positive feelings about the welfare that will bring on the students and the society encouraged the enrolled teachers to transform their teaching practices.

Teacher Hsu: ...the students can learn and have fun in the classes. Besides, the needs of our country make me switch my position. We need creative and critical thinkers instead of bookworms. Helping students learning by constructing meanings

is more promising.

The structure of minds

The teachers brought their believes about the natures of students' learning, science teaching, and science discipline into the program. Based on the constructs of Constructivism, the teachers as learners, construct understandings of new knowledge from the personal practical knowledge. And these influence the effects of a professional development programs.

1. Teachers' views of the professional development program.

From the data, it is shown that teachers had various understandings of constructivist instructional approaches and the goals of the curriculum action research. They argued from time to time about their interpretations of objectives of the curriculum action research. And it is obviously that teachers' misinterpretations of the goals the curriculum action research as a top-down way to transform their teaching. The teachers usually said: "This exemplified approach is not appropriate considering current educational practice" or "What am I supposed to do?" However, through the communications and discussions progressed, the teachers changed their words, they usually said: "Considering my situation, I would like to conduct an action research on..."

2. Teachers' views of the nature of students' learning.

The teachers usually hold views of learning in accordance with positivist epistemology. They made a causal relationship between the amount of time they spent in lecturing and students' learning outcomes. If students did not learn well, it is interpreted as the students did not listen carefully. With this transmission view of learning, the teachers usually consider discussion as inappropriate and unnecessary.

> Teacher Zuey: It is astonishing to realize that most of my colleagues considered that it is wasting time to provide students opportunities to discuss questions, and the discipline problems are also seriously concerned. Therefore, I selectively adopting the approach, and did not discuss my feelings with my colleagues after

then to prevent arguing with them.

> Teacher Chan: We often neglect the learners cognitive process, and hurry in transmitting knowledge to students. We seldom consider how well students can understand us, we spend lots of time to explain concepts, however, students do not get insights. This is because we seldom try to help students make the connections, and students can not learn concepts meaningfully.

3. Teachers views of the nature of science teaching.

The teachers usually considered teaching as transmitting facts. With this prior views of the nature of science teaching, the teachers were aroused and sometimes annoyed when the science educators criticized their teaching practices.

> Teacher Yeh: Before I attended the program, I thought the teacher is a transmitter of facts, is authoritative and is an expert in subject matter knowledge....

> Teacher Guo: In the first year, the professors told me the way I taught was problematic, it should be improved, teaching is not transmitting facts; the teacher should not behave like a sage on the stage, ... these were totally conflicted with what I thought, and I thought you professors always confessed on theories, and theory is one thing, practice is definitely another.

4. Teachers views of the nature of science disciplines.

When teachers explained why they did not try the approaches, they often referred to the content and format of the mandatory textbooks. And their constructions of the nature of each discipline is influenced by their perceptions of the textbooks.

> Teacher Yeh: I learned Constructivism before, but I did not try the approach, because I thought the nature of Biology is different

from Mathematics and other science disciplines. Although students have some prior understandings about Biology concepts, but they also have never learned some concepts, if we expect them to figure out certain concepts by group discussion, they might get confused and be unable to achieve it.

Teacher Huang: ...Take Biology as an example, the content of Biology is basically experiments, Mathematics and Earth Science are didactic, if we expect students to learn from group discussions, then we have to reorganize and design some discussion questions for students to learn.

The structure of society

1. The influences of the teachers social status.

The teachers who were considered being successful in adopting constructivist approach complained that while they were back to the schools, the routines in their schools inhibited them from transforming their instructional approaches. In Taiwanese schools, the teacher have no rights to organize own schedule and teaching contents as the teachers in US. They must follow the mandatory schedules set by their schools and train their students to answer closed-ended questions in examinations in order to achieve better. These made them think the introduced constructivist instruction approaches are not appropriate while considering current education practice.

Teacher Guan: When transforming into Constructivist teaching, it is important to have positive responses from students, parents, and administrators. While expecting teachers to make changes, it is encouragement instead of critiques and interventions that can help teachers to go on.

Teacher Huang: There are lots of activities , varieties of tests, and scheduled progress in schools, for saving time and keep on track, the teachers can not help in adopting conventional teaching

strategies.

> Teacher Yang: The middle school teachers have no rights in organizing own teaching contents as university professors. Our prior responsibility is to explain the concepts clearly and providing plenty of test exercises.

Besides, the teachers usually do not want to be thought as "special". Conventionally, the teachers were expected to teach instead of conducting researches. They would back out if their colleagues perceived them as "different".

2. The teachers' arrogant perception of being a "good" teacher.

The Chinese tradition of admiring the elite makes the parents expect their children to be outstanding in academic areas. Therefore, a teacher who can help their children score high in the entrance examination will be praised as a "good" teacher. The arrogant perception of being a "good" teacher make the teachers hesitate to take the risks to transform their teaching practice. Regarding the policy of issuing admission, the teachers who are qualified to get in the program are usually with more than seven-year teaching experience and labeled "good" teachers by parents.

> Teacher Guo: In these seven years, I have put all my effort to become a star teacher, and finally I earn respects from parents. The parents tried every ways to be placed in my classes. In my school district, I have confidence that all parents knows me. I am proud of my teaching style and teaching strategies.... I thought, be realistic, professors, this approach will fail, and I will do my way.

> Teacher May: From these three years' learning, I am positive in the problem-centered teaching approach, and I believe that the learning outcomes are better if having students construct their own concepts. However, the time limitation and the test mode of the entrance examination are for the conventional teaching and against

constructivist approach, so I did not try it in my classes.

REFLECTIONS

In the curricula remodeling project, the in-service teachers showed various progress in adopting constructivist instruction approaches. The data indicate that the progress is a function of combinations of ability, structure of minds, structure of feelings, and social structure. It is obviously that the teachers do have benefited from the program. However, we face a problem that no critical pedagogy in place, there is only a unclear and inadequate idea of how to educate in-service teachers. The teachers as well as the science educators have came through systems of schooling that have them unprepared for the exercise of the dialectic of community involvement in the universities/schools. How to elaborate the results to establish a improved professional development model, is an important issue for further research.

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